## RECENT LITERATURE

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2006 Notes on the life history of Lucia limbaria (Swainson, 1833) in South Australia. Victorian Entomologist 36: 77-83.

# A NEW SPECIES OF *PROANOPLOMUS* SHIRAKI FROM BORNEO, WITH NOTES ON *P. CINEREOFASCIATUS* (DE MEIJERE) AND THE *ANOPLOMUS* GROUP OF GENERA (DIPTERA: TEPHRITIDAE: GASTROZONINI)

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#### Abstract

Proanoplomus tenompokensis sp. n. is described and illustrated from Sabah, East Malaysia. P. cinereofasciatus (de Meijere) is discussed and recorded from Sumatra and Java in Indonesia. Sinanoplomus Zia and Rhaibophleps Hardy are placed as new synonyms of Anoplomus Bezzi, resulting in three new combinations, viz. A. fasciatus (Walker), A. seclusa (Hardy) and A. sinensis (Zia). A revised key to Proanoplomus Shiraki and a key to the seven known Anoplomus species are provided.

# Introduction

The identity of the Indonesian *Proanoplomus cinereofasciatus* (de Meijere) has become confused in recent years, with its correct generic placement only recently resolved (Kovac *et al.* 2006). Previous confusion has resulted from errors in the original description (de Meijere 1924) and an inaccurate comment that 'the wing markings and other details appear to be as in *P. laqueatus* [now *Pardalaspinus laqueatus* (Enderlein)]' by Hardy (1988). This has led to an inability to correctly identify specimens from Java, which has resulted in various misidentifications. Furthermore, the record from Sabah, East Malaysia (Hardy 1988) belongs to a different species, described below.

This study attempts to resolve the confusion surrounding this poorly known fly and facilitate proper identification in the future. A previous key to species (Hancock 1999) is also updated. In addition, the *Anoplonus* group of genera is discussed, with several synonymies and new combinations proposed. This study has been aided by the examination of both the Sabah specimen noted above and photographs of a male syntype of *P. cinereofasciatus* [one of four (2 males, 2 females) collected in Sumatra by E. Jacobson in May 1914], kindly provided by Keith Arakaki of the B.P. Bishop Museum and Herman de Jong of the University of Amsterdam, respectively.

# Proanoplomus tenompokensis sp. n.

(Fig. 1)

Proanoplomus cinereofasciatus: Hardy, 1988: 108. (partim: Sabah specimen only). Misidentification.

Pardalaspinus cinereofasciatus: Hancock & Drew, 1994: 876. (partim: Sabah record only).

Ceratitoides cinereofasciatus: Hancock, 1999: 940. (partim: Sabah record only). Proanoplomus cinereofasciatus: Kovac et al., 2006: 189. (partim: Sabah record only).

*Type. Holotype* of, EAST MALAYSIA (SABAH): labelled 'British N. Borneo, Tenompok, 15.ii.1959 / T. C. Maa, Collector'. In B.P. Bishop Museum, Honolulu.

Description, Male (Fig. 1). Length of body 5.5 mm, of wing 6.0 mm. Head broad, higher than long; epistome slightly projecting; fulvous except face vellow and occiput black above and between the swollen, yellowish-white occipital lobes; setae black but largely abraded: two pairs frontals (third pair abraded?) and two pairs orbitals; ocellars abraded; postocular row thin and dark. Antennae shorter than face; second segment with fine, red-brown setulae: third segment blackened, apically rounded and slightly upturned at tip; arista short-plumose. Thorax shining blackish-brown to black, without whitish-tomentose areas on scutum; microsetae black except whitish on anepisternum; with yellow areas as follows: narrow edge to postpronotal lobes except ventrally, a pair of very short and barely discernable postsutural vittae, broad anepisternal stripe reaching postpronotal lobe dorsally, parts of anatergite and katatergite; notopleural calli and suture with a dark fulvous tinge. Scutellum swollen, rounded and entirely black. With a full complement of setae, including postpronotal, presutural, dorsocentral and prescutellar; four scutellars; one anepisternal. Legs with femora mostly black; tibiae, tarsi and apices of fore femora fulvous; mid tibiae with one long spine at apex.

Wing typical of genus; hyaline with blackish-brown markings as follows: a broad subbasal area reaching middle of pterostigma [cell sc] and divided medially from middle of cell c; an oblique band from apex of vein  $A_1$ + $Cu_2$ , crossing centre of cell dm and enclosing R-M crossvein, connecting with a broad costal band from beyond apex of cell sc that is confluent with vein  $R_{4+5}$  except at apex where it enters cell m; a narrow, oblique subapical band from near middle of costal band to wing margin below the apex of vein M; a triangular band across DM-Cu crossvein that expands posteriorly to wing margin and very faintly extends anteriorly as a curved band to or near the band across R-M crossvein. Veins  $R_1$  and  $R_{4+5}$  setose; costal setulae slightly thickened above apex of cell c but no distinct seta above tip of vein Sc. Abdomen blackish-brown, with tergites II and IV densely whitish tomentose; tergites II-V normal in shape, neither enlarged nor reduced.

Female unknown.

Distribution. Only known from Sabah, East Malaysia.

Etymology. Named after the type locality.

Comments. This species differs from both *P. formosanus* (Shiraki) from Taiwan and *P. cinereofasciatus* from Indonesia in having the postpronotal lobes dark brown to black with yellow margins. It also differs from *P. cinereofasciatus* in lacking pale microsetae or tomentose bands on the scutum and from *P. formosanus* in the broader whitish-tomentose bands on abdominal tergites II and IV. From *P. nigroscutellatus* Zia from SW China and NE India, *P. tenompokensis* differs in the yellow-margined postpronotal lobes and the less conspicuously convergent wing bands across the R-M and DM-Cu crossveins towards the wing margin posteriorly.

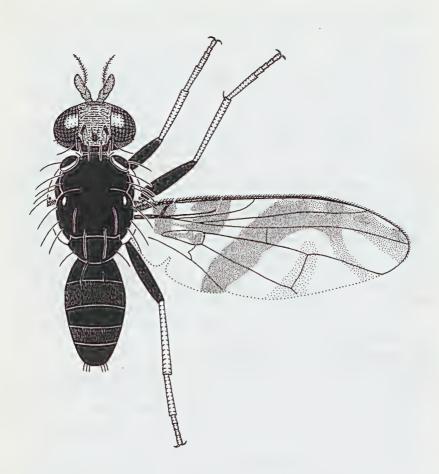


Fig. 1. Proanoplomus tenompokensis sp. n. Habitus of holotype male.

# Proanoplomus cinereofasciatus (de Meijere)

Carpophthoromyia cinereofasciata de Meijere, 1924: 37. (Tandjung Andalas, Sumatra, Indonesia).

Paranoplomus formosanus: Hering, 1952: 285. (Mt Gede & Idjen, Java, Indonesia). Misidentification.

Proanoplomus cinereofasciatus: Hardy, 1988: 108. (partim: type specimens only).

Proanoplomus sp. near japonicus: Hardy, 1988: 108. (Mt Gede & Idjen, Java, Indonesia). Misidentification.

Pardalaspinus cinereofasciatus: Hancock & Drew, 1994: 876. (partim: Indonesian records only).

Proanoplomus sp. [near omeiensis]: Hancock & Drew, 1994: 880. (Mt Gede & Idjen, Java, Indonesia). Misidentification.

Proanoplomus sp. near intermedius: Hancock, 1999: 937. (Idjen, Java, Indonesia). Misidentification.

Ceratitoides cinereofasciatus: Hancock, 1999: 940. (partim: Indonesian records only). Proanoplomus cinereofasciatus: Kovac et al., 2006: 189. (partim: Indonesian records only).

Comments. The original description by de Meijere (1924) contains several errors. The scutum is not entirely black but has the postpronotal lobes and a pair of short, lateral postsutural vittae yellowish. The wing has the brown subapical band across the apex of vein M ending at the wing margin, not at the vein. The abdomen has tergites II and IV (not II and III) broadly whitish tomentose. The wing pattern and scutellum are inseparable from those of P. tenompokensis but other characters differ as noted under the latter species. The extent of the pale (greyish-white or yellowish-grey) longitudinal tomentose bands on the scutum appears to be variable and P. formosanus appears to be best separated by the narrower whitish-tomentose bands on abdominal tergites II and IV (Shiraki 1933). Note that the figure '5' given at the beginning of de Meijere's (1924) description refers to the month of capture, not the number of specimens.

Distribution. P. cinereofasciatus is known with certainty only from the Indonesian islands of Sumatra and Java.

# Revised key to Proanoplomus species

This key to *Proanoplomus* Shiraki species is modified from Hancock (1999) to include *P. cinereofasciatus* and *P. tenompokensis*. It also incorporates additional characters noted by Wang (1998) for Chinese species.

4	Fore femora yellow with a brown apical mark; mid and hind femora yellow basally, dark brown to black apically
-	All femora black (China [Yunnan, Guangxi], NE India [Assam], Burma, Thailand, Laos, Indonesia [Java])
5	Apex of costal band broad, extending two-thirds distance between veins $R_{4+5}$ and M; oviscape almost cylindrical, more than twice as long as wide (Taiwan)
	Apex of costal band narrow, extending half distance between veins $R_{4+5}$ and M; oviscape flattened, about 1.3-1.5 times as long as wide (Japan [Hokkaido, Honshu, Shikoku, Kyushu])
6	Scutellum with a transverse whitish band on disc, sometimes darkened medially, surrounded by black (NE Burma) P. longimaculatus Hardy
-	Scutellum black on disc, with or without narrow lateral yellow bands
7	Wing with apical half of pterostigma [cell sc] brown and brown band across vein M isolated from costal band; ocellar setae thin, hair-like; scutum with postpronotal lobes brown and lateral postsutural yellow vittae absent; scutellum with a narrow basolateral yellow streak; fore femora yellow-brown (southern Vietnam)
-	Wing with apical half of pterostigma [cell sc] hyaline and brown band across vein M connected (sometimes weakly) to costal band; ocellar setae well developed; scutum, scutellum and femora not with the above combination of characters
8	Scutellum with a broad median black longitudinal band and a pair of basolateral black spots, leaving a curved yellow band on each side; postpronotal lobes yellow
-	Scutellum entirely black, without yellow markings; postpronotal lobes either yellow or largely or entirely dark brown to black
9	Fore femora yellow except brown medially; hind femora yellow basally, brown distally; wing with brown band across DM-Cu crossvein short, ending at vein M (China [Fujian])
_	All femora dark brown to black; wing with brown band across DM-Cu crossvein extending distinctly above vein M
10	Wing with brown band across DM-Cu crossvein connected to band across R-M crossvein in cell $r_{4+5}$ and distinctly broadened below vein $Cu_1$ (Japan [Honshu])
	Wing with brown band across DM-Cu crossvein not connected to band across R-M crossvein in cell $r_{4+5}$ and of even width, not distinctly broadened below vein $Cu_1$ (China [Sichuan])

- \* P. caudatus (Zia) was included in Anoplomus Bezzi by Wang (1998), largely on the basis of its weak ocellar setae, dorsoapically pointed third antennal segment and long-plumose arista. However, it has only one long midtibial spine and a typical Proanoplomus-like wing pattern and is included here in the latter genus. \*\* Contrary to Kovac et al. (2006) [and others], P. cylindricus (Chen) was originally described in Paranoplomus Shiraki.

## Discussion

Proanoplomus tenompokensis and P. cinereofasciatus belong to a group of flies (the Anoplomus group) believed to breed in grasses (Poaceae) (Hancock and Drew 1994, Hancock 1999, Kovac et al. 2006). They are currently referred to the tribe Gastrozonini in subfamily Dacinae, with larval characters (particularly the presence of a ridge on the ventral tubercle of the caudal segment) recently confirming that the tribes Dacini, Ceratitidini and Gastrozonini form a recognisably monophyletic group (Kovac et al. 2006).

Proanoplomus differs from other Asian genera placed in the Anoplomus complex in having only a single long spine at the apex of the mid tibiae and generally well developed ocellar setae (weak in P. caudatus (Zia) and P. spenceri Hardy). The other genera, Anoplomus Bezzi, Sinanoplomus Zia and Rhaibophleps Hardy, all have two (or more) long midtibial spines and rudimentary, hair-like ocellar setae. These genera have been separated largely on setal characters (particularly the presence or absence of postpronotal, presutural and dorsocentral setae) and wing pattern differences. These are poor generic characters, highlighted by the recent description of Anoplomus hainanensis Wang (Wang 1998), which has the postpronotal seta present (as in Sinanoplomus) and an Anoplomus-like wing pattern.

The absence of postpronotal setae in other *Anoplomus* species links that genus with *Rhaibophleps*, which also lacks presutural and dorsocentral setae. *Sinanoplomus* and *Rhaibophleps* are linked by a very similar, elongate and apically truncate aculeus (Hancock 1999), while all three genera have a moderately to very broad dark band across the DM-Cu crossvein and apices of cells dm and cu<sub>1</sub> that reaches the wing margin throughout its length. Numbers of frontal setae (2-3 pairs) and anepisternal setae (1-2) are also variable and useless in defining genera. Separation can thus no longer be maintained or justified and the three genera are combined here as *Anoplomus* Bezzi, 1913 (= *Sinanoplomus* Zia, 1955, syn. n.; = *Rhaibophleps* Hardy, 1973, syn. n.). Seven species are included:

Anoplomus cassandra (Osten Sacken) (= flexuosus Bezzi)
Anoplomus fasciatus (Walker), comb. n. [ex Sinanoplomus]
Anoplomus hainanensis Wang
Anoplomus nigrifemoratus Hardy
Anoplomus rufipes Hardy
Anoplomus seclusa (Hardy), comb. n. [ex Rhaibophleps]
Anoplomus sinensis (Zia), comb. n. [ex Sinanoplomus]

Host plants for both *Anoplomus* and *Proanoplomus* remain unconfirmed but panicoid grasses such as *Panicum* and *Pennisetum* appear likely (Hardy 1973, Hancock 1999). Unlike other Asian species of Gastrozonini, which breed in bamboo shoots (Hancock and Drew 1999, Chua 2003), they are not readily (if at all) attracted to cut bamboo and appear to be closely related to the Afrotropical genera *Bistrispinaria* Speiser, *Leucotaeniella* Bezzi and *Clinotaenia* Bezzi [including *C. superba* (Bezzi) and *C. angusticeps* (Bezzi), which have a 'Sinanoplomus'-like wing pattern: Hancock 1999, De Meyer 2006]. All have distinct, broad, whitish-tomentose bands on abdominal tergites II and IV. Grass breeding has been confirmed only for *Bistrispinaria* (Hancock 1999, Copeland 2007).

The relationships of an additional Southeast Asian genus usually referred to this group, *Pardalaspinus* Hering, remain especially uncertain. It appears to be the sister genus to the Afrotropical *Ceratitoides* Hendel (Hancock 1999) but no host information is available. *Pardalaspinus* and *Ceratitoides* have similar wing patterns but were recently separated by Kovac *et al.* (2006) as, contrary to Hancock (1999), only *Pardalaspinus* has abdominal tergite II enlarged and tergites III and IV reduced [but *c.f. Acrotaeniostola* Hendel, which shows similar variation (Hancock and Drew 1999)]. In characters such as wing pattern and abdominal shape, these two genera appear to be more closely allied to *Acroceratitis* Hendel and its allies than to *Anoplomus* and its allies and, like the former group, might also be bamboo breeders. The listing of *P. maai* (Chen) from India (Sikkim) by Kovac *et al.* (2006) appears to be an error, Sikkim being the type locality of *P. sikhimensis* (Hancock).

# Key to Anoplomus species

The redefined genus *Anoplomus* may be recognised by the presence of two (or more) long apical spines on the mid tibia and vestigial ocellar setae. Hyaline streaks in and below wing cell c are generally weak or indistinct and the brown band in the apical part of cell cu<sub>1</sub> broadly reaches the wing margin. The seven included species (all Indo-Australian) may be identified by the following key.

- Wing with an obliquely transverse hyaline band reaching costa within and/or just beyond cell sc; postpronotal seta absent except in A. hainanensis; 1 or 2 anepisternal setae
- Wing with costal band not extending beyond apex of cell bcu and dark band in cell cu<sub>1</sub> crossing vein A<sub>1</sub>+Cu<sub>2</sub> (East Malaysia [Sarawak, Sabah], Indonesia [Kalimantan])
   A. fasciatus (Walker)
- 4 Wing with pterostigma [cell sc] entirely dark brown; lateral scutellar spots small, not visible from above (Laos) ....... A. nigrifemoratus Hardy

- 6 Postpronotal seta present; 2 anepisternal setae (China [Hainan]) ......

  A. hainanensis Wang
- Postpronotal seta absent; 1 anepisternal seta (India, Burma, China [Yunnan], Thailand, Laos, Philippines [Busuanga, Culion], Indonesia [Java]\*)
   A. cassandra (Osten Sacken)
- \* There are no records of *A. cassandra* from Indonesia since Macquart (1848) reported it (as '*Tephritis fasciventris* Macquart') from Java and this locality, while not unlikely, requires confirmation.

# Acknowledgements

I thank Dr Herman de Jong (Zoological Museum, University of Amsterdam) for providing photographs of *P. cinereofasciatus* type material and an original copy of de Meijere's 1924 description, Keith Arakaki (B.P. Bishop Museum, Honolulu) for lending the Tenompok specimen and Prof. Richard Drew (Griffith University, Brisbane) for help in obtaining literature.

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